Developing a Shared Vision for STEM General Education Reform at a Liberal Arts College

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Introduction

A challenge to transforming STEM higher education is organizing the necessary institutional change effort. Models for achieving this outcome include:

- Developing shared vision: Henderson, Finkelstein, and Beach (2010; Beach, Henderson, & Finkelstein, 2012) reviewed four change strategies in undergraduate STEM education, identifying two underlying dimensions: level of change (individual vs. environment/structure) and whether the intended outcome is already known (prescribed versus emergent). Henderson and colleagues suggest exploring the under-utilized combination of environmental/structural and emergent dimensions: developing shared vision. This approach seeks to bring together groups of faculty to determine common goals and identify the environmental/structural elements that might need to change.

- "Top-down" and "bottom-up" approaches are used. At the "top," university administrators must support reform efforts by speaking about their importance and/or providing resources to facilitate them. The "bottom up" element must come from faculty interest and faculty must serve as the drivers of change. Kezar and Eirod (2012) echo this conclusion, but state that few colleges have attempted this integrated approach.

- "Change agents." A challenge to implementing Austin’s approach is encouraging engagement and organization among faculty. A "change agent" whose role is to facilitate coordinated efforts is necessary (Beach et al., 2012). Pepper, Chasteen, Pollock, and Perkins (2012) describe how a "change agent" facilitated reform within a science department; however, as suggested by Kezar and Eirod (2012), in order to move forward with institutional change, one needs the support of a critical mass of faculty across multiple departments to develop a shared vision. Model, Dolinsky, Ferren, and McHamby (2015) note that the relatively "flat" leadership structure of colleges may make organizing institutional change difficult, but this might actually be an advantage, enhancing the opportunity for informal groups to work together in developing a shared vision. We offer the model below (Figure 1), a hybrid of other approaches, for use at small schools.

Our Steps to Institutional Change

- We have one faculty member from Chemistry and one from Psychology.
- Each has different skills and social/professional networks.
- Each change agent had a regular one-quarter hour bow to develop expertise.
- Applied for and received an external grant to sustain project for at least three years.
- Picked a topic of interest to larger group and on which there was already some consensus.
- All surveyed on STEM gen ed with a 65% response rate (see Table 1).
- Found consensus on emphasizing scientific, giving (own) content for general education reform.
- Individual meetings with administrators (e.g., Student Life, IR, Faculty Development, President).
- Transparency with faculty via open meetings (with food & drink) and workshop.
- Sent agents in advance of open meetings as follows:
  - A science and math liaison from each of our 8 STEM departments (see Table 1).
  - Liaisons worked with departments on adopting shared general education learning goals.
- Open meetings (Divisional and Brown Bag) to get input and to educate faculty.
- Kept attendance as participation data (see Table 1).
- Shared data from IIR (number of majors, "success" from gen ed courses) to draw faculty into conversation.
- Gathered additional data (e.g., scientific literacy with TOSLS—see Figure 2, Tables 2 and 3).
- Used data to inform decisions and revise process (e.g., changed divisional meeting times).
- Provided different entry points for engagement.
- Opened pedagogy workshops (see Table 1).
- NSF-funded course reform grants, team projects.
- NSF-IUSE grant successfully funded.
- Submitted HHMI grant to move learning community towards "inclusive excellence".

Take-away Recommendations

- Change agents: More than one "change agent" is beneficial.
- Relationships: Take advantage of "social capital" in existing relationships; nurture these relationships and continue to develop new ones.
- Communication: Frequent, transparent communication with all constituencies is crucial.
- Structure: Work within formal structures, but also utilize informal networks.
- Data: Rather than calling it "assessment," use data to engage faculty and collect more data.

Successes and Challenges

Successes

- Establishment of a university STEM "working" or liaison group.
- High faculty participation in discussions.
- Leveraged process to successfully apply for NSF-IUSE grant.
- Work with the administration has helped us to align institutional priorities.

Challenges

- Pace of change has been slower than some desire.
- Moving ownership from change agents to broader faculty has been difficult.
- Time and scheduling are barriers to participation.

Results

- Initial Gen Ed Survey 2013: 65%.
- Attended 1+ Divisional Meeting: 80%.
- Attended 2+ Divisional Meetings: 80%.
- Attended 1+ Brown Bag Lunch: 75%.
- Attended 3+ Brown Bag Lunch: 42%.
- Attended 1+ summer workshop: 65%.
- Attended 1+ Autumn: 85%.
- Attended 4+ Autumn: 66%.
- Attended 1+ Autumn: 51%.
- End of year Assessment Plan: 80%.
- Change Agents: 30% change in data from initial (80%)

Table 1: STEM Faculty Participation in Reform Efforts

<table>
<thead>
<tr>
<th>Activity</th>
<th>Initial Gen Ed Survey</th>
<th>Attended 1+ Divisional Meeting</th>
<th>Attended 2+ Divisional Meetings</th>
<th>Attended 1+ Brown Bag Lunch</th>
<th>Attended 3+ Brown Bag Lunch</th>
<th>Attended 1+ Summer Workshop</th>
<th>Attended 1+ Autumn</th>
<th>Attended 4+ Autumn</th>
<th>Attended 1+ Autumn</th>
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</thead>
<tbody>
<tr>
<td>Initial Gen Ed Survey</td>
<td>2013</td>
<td>16%</td>
<td>41%</td>
<td>61%</td>
<td>75%</td>
<td>80%</td>
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<td>Attended 2+ Divisional Meetings</td>
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<td>Attended 1+ Brown Bag Lunch</td>
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<tr>
<td>Attended 3+ Brown Bag Lunch</td>
<td>2013</td>
<td>16%</td>
<td>41%</td>
<td>61%</td>
<td>75%</td>
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<tr>
<td>Attended 4+ Autumn</td>
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References


http://www.depauw.edu/offices/academic-affairs/teaching-and-learning/wiser/